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JCS925 U.S. PTO

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<b>UTILITY PATENT APPLICATION TRANSMITTAL</b>  (New Nonprovisional Applications Under 37 CFR § 1.53(b))		Attorney Docket No. <b>SNY-P3965</b>
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JC 925 U.S. PTO  
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JC 09/686120**TO THE ASSISTANT COMMISSIONER FOR PATENTS:**

Transmitted herewith is the patent application of ( ) application identifier or (X) first named inventor, Gilbert Ho Yin Tsang, entitled IP Address Discovery for Cable Modem in Set-Top Box, for a(n):

(X) Original Patent Application.

( ) Continuing Application (prior application not abandoned):

( ) Continuation ( ) Divisional ( ) Continuation-in-part (CIP)  
of prior Application No. \_\_\_\_\_, filed on \_\_\_\_\_.

( ) A statement claiming priority under 35 USC § 120 has been added to the specification.

Enclosed are:

(X) Specification, 34 Total Pages. (X) Drawing(s); 2 Total Sheets.

(X) Oath or Declaration:

(X) A Newly Executed Combined Declaration and Power of Attorney

(X) Signed. ( ) Unsigned. ( ) Partially Signed.

( ) A Copy from a Prior Application for Continuation/Divisional (37 CFR § 1.63(d)).

( ) Incorporation by Reference. The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied, is considered as being part of the disclosure of the accompanying application and is hereby incorporated herein by reference.

( ) Signed Statement Deleting Inventor(s) Named in the Prior Application. (37 CFR § 163(d)(2))

( ) Power of Attorney. (X) Return Receipt Postcard

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( ) Preliminary Amendment. (X) Information Disclosure Statement and Form PTO-1449.

( ) A Certified Copy of Priority Documents (if foreign priority is claimed)

( ) Statement(s) of Status as a Small Entity.

( ) Statement(s) of Status as a Small Entity Filed in Prior Application, Status Still Proper and Desired

(X) Other: Assignment and Cover Sheet

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Total Claims	71	51	\$18.00	\$918.00
Independent Claims	9	6	\$78.00	\$468.00
Multiple Dependent Claim Fee (if applicable)				\$0.00
Assignment Recording Fee (if applicable)				\$40.00
Basic Filing Fee				\$690.00
		Total Filing Fee		\$2,116.00

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Respectfully submitted,

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5 **IP ADDRESS DISCOVERY FOR CABLE MODEM IN SET-TOP BOX**

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9 **FIELD OF THE INVENTION**

10 This invention relates generally to the field of Set-Top Boxes. More  
11 particularly, the present invention is related to a Set-Top Box having distinct Cable  
12 Modem (CM) or other managed component and Main Circuit Board (controller)  
13 components and a mechanism for providing the Main Circuit Board with the ability  
14 to know the IP address of the Cable Modem.

15  
16 **BACKGROUND OF THE INVENTION**

17 Set-Top Boxes used for cable television and satellite communications are  
18 proliferating and becoming a powerful hub for home entertainment. Such Set-Top  
19 Boxes, particularly digital Set-Top Boxes, not only facilitate the tuning of television  
20 programming but also are destined to provide pay per view, interactive television  
21 and Internet access to subscribers. Digital Set-Top Boxes are basically powerful  
22 computers with high-speed communications ability. However, such Set-Top Boxes,  
23 in order to become widely accepted and utilized, should be manufacturable at low  
24 cost and be easily repaired. In certain environments, it is advantageous to  
25 manufacture a Set-Top Box using multiple modular components which interact with  
26 one another. For example, a main computer circuit board can readily be  
27 manufactured as one assembly while a display mechanism and a Cable Modem  
28 can be manufactured as two other circuit boards, modules or sub-assemblies. This  
29

1 permits easy upgrade of the Cable Modem or the Main Circuit Board (Main Board)  
2 to add enhanced features at reasonable cost. Moreover, this facilitates the ability  
3 to utilize Cable Modems, Digital Subscriber Line (DSL) modems or satellite  
4 modems or other communication mechanisms in conjunction with a single  
5 standard Main Circuit Board.

6 In general, Cable Modems and other such communication devices  
7 communicate over the cable or other media via IP (Internet Protocol.) Thus, an  
8 Internet Protocol (IP) address is assigned to the Cable Modem by the network  
9 administrator to facilitate network management and administrative functions. This  
10 may present difficulty, however, in providing a multiple circuit board modular  
11 approach to a Set-Top Box design in that the Main Board often needs to carry out  
12 actions requiring the IP address but may not have easy access to it since it is  
13 basically assigned to the Cable Modem. Thus, a mechanism is needed to  
14 communicate the IP address from the Cable Modem to the Main Circuit Board. It  
15 is also desirable to share a single display controlled by the Main Circuit Board to  
16 display not only information related generally to the operation of the Set-Top Box,  
17 but specifically to the Cable Modem. In each such case, the Main Circuit Board  
18 may require an IP address for the Cable Modem in order to utilize the common  
19 display.

20 While it is possible to hard wire memory locations or provide elaborate  
21 circuitry to provide the Main Circuit Board with the IP address residing in the Cable  
22 Modem, the interconnections required to accomplish this would increase the cost  
23 of the Set-Top Box, increase the wiring complexity and decrease reliability. It is  
24 therefore desirable to use conventional interconnection techniques such as  
25 Ethernet protocol or other protocol requiring minimal interconnection to couple the  
26 modules within the Set-Top Box together. Under these constraints, there remains  
27 the problem of how to communicate an IP address which may be assigned and  
28 reassigned by a network administrator from the Cable Modem to the Main Circuit  
29 Board.

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## SUMMARY OF THE INVENTION

5 The present invention relates generally to Set-Top Boxes. Objects,  
6 advantages and features of the invention will become apparent to those skilled in  
7 the art upon consideration of the following detailed description of the invention.

8 A Set-Top Box, according to certain embodiments, is configured with a  
9 modem and a Main Circuit Board. The Main Circuit Board determines an IP  
10 address of the modem by periodically broadcasting a Discovery Packet from the  
11 modem to a broadcast address, the Discovery Packet having at least the IP  
12 address of the modem. At the Main Circuit Board, the broadcast Discovery Packet  
13 is received from the modem. The IP address of the modem is ascertained from the  
14 broadcast Discovery Packet.

15 In one embodiment of the present invention a Set-Top Box is configured with  
16 a modem and a Main Circuit Board. A method of enabling the Main Circuit Board  
17 to determine the IP address of the modem, includes at the modem: periodically  
18 broadcasting a Discovery Packet from the modem to a broadcast address, the  
19 Discovery Packet having at least the IP address of the modem; and at the Main  
20 Circuit Board: receiving the broadcast Discovery Packet from the modem; and  
21 ascertaining the IP address of the modem from the broadcast Discovery Packet.

22 A Set-Top Box consistent with embodiments of the present invention  
23 includes a modem. A Main Circuit Board is interconnected to the modem via an  
24 interconnection. The modem includes a mechanism, residing within the modem,  
25 for periodically transmitting a Discovery Packet from the modem to the Main Circuit  
26 Board. The Discovery Packet has at least an IP address of the modem.

27 A Set-Top Box consistent with certain embodiments of the invention,  
28 includes a modem. A Main Circuit Board is interconnected to the modem via any  
29 suitable interconnection. A programmed processor, residing within the modem,  
30 transmits a Discovery Packet from the modem to the Main Circuit Board at intervals

1 of approximately 30 seconds, or any other time interval desired depending upon  
2 how frequently it is desired to have the Main Circuit Board learn the IP address of  
3 the modem. The Discovery Packet preferably has an IP address of the modem,  
4 and a suitable authentication code such as a ten character ascii authentication  
5 code, digital signature, encryption key, etc. The Main Circuit Board, upon receiving  
6 the Discovery Packet, inspects the authentication code to assure that the IP  
7 address in the Discovery Packet originated at the modem. The Discovery Packet  
8 further includes a multiple byte (e.g. four byte) integer status code indicative of a  
9 running status of the modem. A display is preferably coupled to the Main Circuit  
10 Board and can display a status of the modem.

11 In a Set-Top Box configured with a modem and a Main Circuit Board  
12 according to embodiments of the present invention, a method of enabling the Main  
13 Circuit Board to determine the IP address of the modem, includes: establishing a  
14 predetermined relationship between a hardware address of the modem and a  
15 hardware address of the circuit board; at the Main Circuit Board: ascertaining the  
16 hardware address of the modem from the predetermined relationship; sending a  
17 query (e.g. a RARP - Release Address Resolution Protocol query) from the Main  
18 Circuit Board to the hardware address of the modem requesting the modem's IP  
19 address; and receiving a reply from the modem providing the modem's IP address  
20 to the Main Circuit Board.

21 In a Set-Top Box configured with a modem and a Main Circuit Board  
22 according to another embodiment of the invention, a method of enabling the Main  
23 Circuit Board to determine the IP address of the modem, includes: establishing a  
24 predetermined relationship between a hardware address of the modem and a  
25 hardware address of the circuit board; at the Main Circuit Board: ascertaining the  
26 hardware address of the modem from the predetermined relationship; at the  
27 modem: receiving a query from the Main Circuit Board to the hardware address of  
28 the modem requesting the modem's IP address; and sending a reply from the  
29 modem providing the modem's IP address to the Main Circuit Board.

30 A Set-Top Box consistent with certain embodiments of the invention includes

1 a modem. A Main Circuit Board is interconnected to the modem via an  
2 interconnection. The Main Circuit Board and the modem have hardware  
3 addresses which are related using a predetermined relationship. A processor,  
4 residing within the Main Circuit Board, determines the modem's hardware address  
5 from the Main Circuit Board's address and the predetermined relationship. The  
6 processor transmits a request from the Main Circuit Board to the modem over the  
7 interconnection using the hardware address of the modem, the request including  
8 a request for the modem's current IP address. The processor receives a reply from  
9 the modem containing the modem's current IP address.

10 A Set-Top Box consistent with other embodiments of the invention includes  
11 first and second managed components. A Main Circuit Board is interconnected to  
12 the first and second managed components via any suitable interconnection. Each  
13 of the first and second managed components periodically transmits a Discovery  
14 Packet to the Main Circuit Board. The Discovery Packet has at least an IP address  
15 of the managed component from which it was transmitted, and preferably a  
16 signature that is used by the Main Circuit Board to distinguish between the first and  
17 second managed components.

18 A Set-Top Box according to yet another embodiment of the invention  
19 includes a managed component. A Main Circuit Board is interconnected to the  
20 managed component via any suitable interconnection. The managed component  
21 periodically transmits a Discovery Packet to said Main Circuit Board. The  
22 Discovery Packet includes at least an IP address of the managed component.

23 In Set-Top Box configured with first and second managed components and  
24 a control circuit, a method consistent with certain embodiments of the invention  
25 enables the control circuit to determine the IP address of the first and second  
26 managed components by: establishing a predetermined relationship between a  
27 hardware address of the first and second managed components and a hardware  
28 address of the control circuit; at the Main Circuit Board: ascertaining the hardware  
29 address of the first managed component from the predetermined relationship;  
30 ascertaining the hardware address of the second managed component from the

1 predetermined relationship; sending a query from the Main Circuit Board to the  
2 hardware address of the first managed component requesting the first managed  
3 component's IP address; receiving a reply from the first managed component  
4 providing the first managed component's IP address to the Main Circuit Board;  
5 sending a query from the Main Circuit Board to the hardware address of the second  
6 managed component requesting the second managed component's IP address;  
7 and receiving a reply from the second managed component providing the second  
8 managed component's IP address to the Main Circuit Board.

9 The above summaries are intended to illustrate exemplary embodiments of  
10 the invention, which will be best understood in conjunction with the detailed  
11 description to follow, and are not intended to limit the scope of the appended  
12 claims.

#### 13 14 BRIEF DESCRIPTION OF THE DRAWINGS

15 The features of the invention believed to be novel are set forth with  
16 particularity in the appended claims. The invention itself however, both as to  
17 organization and method of operation, together with objects and advantages  
18 thereof, may be best understood by reference to the following detailed description  
19 of the invention, which describes certain exemplary embodiments of the invention,  
20 taken in conjunction with the accompanying drawings in which:

21 **FIGURE 1**, a block diagram of a Cable Modem using a modular circuit  
22 configuration.

23 **FIGURE 2**, is a message flow diagram for a first embodiment consistent with  
24 the present invention.

25 **FIGURE 3**, is a first embodiment of a Discovery Packet in accordance with  
26 embodiments of the present invention.

27 **FIGURE 4**, is a second embodiment of a Discovery Packet in accordance  
28 with certain embodiments of the present invention.

1                   **FIGURE 5**, is a flow chart illustrating an alternative embodiment of the  
2 present invention utilizing Reverse Address Resolution Protocol.  
3  
4

5                   **DETAILED DESCRIPTION OF THE INVENTION**

6                   While this invention is susceptible of embodiment in many different forms,  
7 there is shown in the drawings and will herein be described in detail specific  
8 embodiments, with the understanding that the present disclosure is to be  
9 considered as an example of the principles of the invention and not intended to limit  
10 the invention to the specific embodiments shown and described. In the description  
11 below, like reference numerals are used to describe the same, similar or  
12 corresponding parts in the several views of the drawings.

13                  Referring now to **FIGURE 1**, a cable Set-Top Box 100 is illustrated using a  
14 modular construction in accordance with the present invention. In this  
15 embodiment, a controlled device (or multiple controlled devices) such as Cable  
16 Modem 110 is coupled to a controlling device such as a Main Circuit Board 120 via  
17 an interconnection 130. The interconnection 130 is preferably a standard  
18 interconnection such as Ethernet, USB (Universal Serial Bus), PCI bus, etc. The  
19 Cable Modem 110 is linked via a coaxial cable 140 to an upstream service provider  
20 that manages the IP address of Cable Modem 110. In addition, an LCD display,  
21 or other type of display, 150 may be provided in the Set-Top Box to provide status  
22 information and other information useful to the subscriber.

23                  By using standard Ethernet connections and the like for interconnection 130,  
24 standard components can be utilized with minimal interconnection lines coupling  
25 the Cable Modem 110 to the Main Board 120. By way of example, integrated  
26 Ethernet circuits can be utilized within the Cable Modem 110 and Main Board 120  
27 to facilitate communication at minimal cost. Custom or semi-custom integrated  
28 circuits can be utilized along with programmed processors to implement the Cable  
29 Modem 110 and the Main Board 120.

1           While **FIGURE 1** illustrates a Set-Top Box 100 utilizing a Cable Modem 110,  
2 those skilled in the art will recognize that the invention is not so limited since a DSL  
3 modem, satellite modem or other controlled device interconnected with a controller  
4 such as Main Circuit Board 120 via an interconnection mechanism 130 can equally  
5 well utilize the present invention without limitation.

6           As previously stated, the Cable Modem 110 receives a dynamically allocated  
7 IP address from a network administrator in order to carry out network administration  
8 functions. Thus, the IP address is subject to change and is not a hard address that  
9 can be coded into the Cable Modem logic. However, Main Board 120 may require  
10 access to the Cable Modem's IP address in order to carry out various functions over  
11 the network. Due to the dynamic assignment of IP addresses to Cable Modem  
12 110, the Main Board 120 should be able to obtain the most recently assigned IP  
13 address in order to assure correct functionality. In certain embodiments of the  
14 invention, both Cable Modem 110 and Main Board 120 include programmed  
15 processors for carrying out the processes to be described hereinafter.

16           With reference to **FIGURE 2**, one embodiment of the present invention  
17 provides for the Cable Modem 110 (or other controlled device or network device)  
18 to broadcast to Main Circuit Board 120 (or other controller), via interconnection 130,  
19 a Discovery Packet on a periodic basis as illustrated in the message flow diagram  
20 200. This Discovery Packet is preferably communicated using the well known User  
21 Datagram Protocol (UDP) for supplying short messages with low overhead. Thus,  
22 on a periodic basis with period  $\Delta T$ , a Discovery Packet is transmitted from the  
23 managed component (in this case Cable Modem 110) to the Manager Component  
24 (in this case the Main Circuit Board 120).

25           **FIGURE 3** describes the Protocol Data Unit (PDU) of one embodiment of the  
26 Discovery Packet 300 used in conjunction with the present invention. In this  
27 embodiment, a Discovery Packet 300 is made up of an IP header 310, a UDP  
28 header 320 and a signature 330. In this case the signature is a defined signature  
29 (e.g. a multiple character ascii character string that might be encrypted) that tells

1 the Main Circuit Board 120 that the Discovery Packet is being sent directly by the  
2 Cable Modem 110 or other managed component. In time period  $\Delta T$  may be any  
3 suitable convenient time period such as, for example, 30 seconds. Once this  
4 Discovery Packet is transmitted from the Cable Modem 110 to the Main Board 120,  
5 the Main Board 120 can ascertain the IP address from the IP header 310. Main  
6 Board 120 can then utilize the IP address as required to carry out any operations.  
7 The managing device (Main Board 120) should preferably only accept packets with  
8 the proper signature from the managed device (Cable Modem 110) for  
9 authentication purposes, but this should not be considered limiting since alternative  
10 embodiments may not require the signature 330. Yet other arrangements can use  
11 encryption such as public key encryption to enhance the security of the signature.  
12 Other protocols and data arrangements can be used for the Discovery Packet.

13 Referring now to **FIGURE 4**, an alternative embodiment of a Protocol Data  
14 Unit used for Discovery Packet 400 is shown. In this embodiment, the Discovery  
15 Packet 400 includes an IP header 410, a UDP header 420, a signature 430 and a  
16 status indicator 440. In certain embodiments, the signature and/or the status code  
17 can be encrypted (e.g. using public key encryption) for higher levels of security. IP  
18 headers 310 and 410 may be essentially identical or similar as well as UDP header  
19 420 and 320. Signature 330 and 430 may also be identical or similar. The status  
20 indicator 440 provides a status indication of the Cable Modem 110 status each time  
21 a Discovery Packet is transmitted to the Main Board 120. In this embodiment, the  
22 Main Board 120 may thus always be apprized of the status of the Cable Modem  
23 110 and can, if desired, display such status using the LCD display 150 without  
24 need to make further inquiries of Cable Modem 110. This provides the STB 100  
25 with a cost effective mechanism to display status information, including status of  
26 the modem, without need for a separate modem status indicator.

27 In the case of the Cable Modem 110, the following **TABLE 1** describes the  
28 type of information contained in the IP header, the UDP header, the signature and  
29 the status designator if used for certain preferred embodiments of the invention

1 wherein the controlled device is a modem. Other protocols and data arrangements  
2 can be used for the Discovery Packet.

4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
PACKET COMPONENT	CONTENT	VALUE
IP header	source address	IP address of CM
	destination address	broadcast address
UDP header	source UDP port	don't care
	destination UDP port	pre-assigned port number (e.g. 8000)
Signature	10 character ascii string	e.g. SONY-STBCM (in hex = 534F4E592D535442434D
Status = 4 byte integer representing running status of managed component	HEX VALUE (for Cable Modem)	MEANING
	0	No QAM DS Signal is presented or Channel acquisition
	1	QAM lock OK
	11	FEC lock OK, Found DS channel
	21	Ranging response received OK, Found US
	31	DHCP response received OK
	41	TOD (Time of Day) response OK
	51	TFTP (Trivial FTP) transfer OK

	61	CMTS registration OK, Modem online, operational and ready to transfer data
byte next to least significant byte	100	Ethernet link established
	200	USB device is presented

TABLE 1

Each value of the four byte status word represents a running status of the Cable Modem 110. Other status word can be devised for other controlled devices and other network devices consistent with the present invention. Other values not appearing in **TABLE 1** are reserved for future use.

The least significant byte indicates the cable modem status. The byte next to the least significant byte indicates the status of the communication link. The remaining two bytes are reserved. Together, the two least significant bytes indicate the running status of the Cable Modem 110. By way of example, hex 361 would mean that the Cable Modem 110 is online and both Ethernet and USB are working. Similarly, hex 161 would mean the cable modem is online and Ethernet is working but no USB. As a final example, 21 hex means the cable modem has received the ranging response and is waiting for DHCP response, and no Ethernet or USB link has yet been established. In certain embodiments, the status as well as the signature discussed above can be encrypted for higher levels of security. Public key encryption or other forms of encryption can be used.

The methods described above provide simple mechanisms for the Main Board 120 to always be apprized of the IP address (and possibly status) of the Cable Modem 110. It should be noted that the information provided in **TABLE 1** is applicable only to a Cable Modem 110. Codes for a DSL modem, a satellite

1 modem or other modem, network device or controlled device may differ.

2 In an alternative embodiment, Reverse Address Resolution Protocol can be  
3 utilized to determine the IP address of the Cable Modem 110. A process for  
4 determining the IP address using this mechanism is illustrated as Process 500 of  
5 **FIGURE 5**. In this process, at the time of manufacture, programming or  
6 configuration, a MAC address is established for both the Cable Modem 110 (or  
7 other controlled device/network device) and the Main Board 120 (controller). For  
8 example, the MAC address for the Cable Modem 110 and Main Board 120 may be  
9 numerically adjacent hardware addresses at 510. Thus, for example, the Cable  
10 Modem 110 address may be equal to the Main Board 120 address +1. In this  
11 manner, the hardware MAC address of the Cable Modem 110 can be readily  
12 ascertained by the Main Circuit Board 120 at 510. Of course, other relationships  
13 can be used.

14 Whenever the Main Board 120 needs an IP address of the Cable Modem  
15 110 at 520, the Main Board 120 simply queries the Cable Modem 110 port side the  
16 address as needed using Reverse Address Resolution Protocol (RARP) at 530.  
17 The IP address is then returned at 540 using Reverse Address Resolution Protocol  
18 so that the Main Board 120 knows the IP address of the Cable Modem 110. The  
19 process then awaits the next incident of the Main Board 120 needing the IP  
20 address of the Cable Modem 110 at 520. This process can be considered  
21 proactive with the Main Board 120 querying to obtain the Cable Modem's IP  
22 address as needed in contrast to the reactive embodiment described earlier, where  
23 the Main Board 120 simply waits for the next broadcast from the Cable Modem 110  
24 of a Discovery Packet.

25 By virtue of requiring a strict relationship between the MAC addresses of the  
26 Cable Modem 110 and the Main Board 120, process 500 may be highly  
27 advantageous in single circuit board Set-Top Boxes. However, should the Main  
28 Board 120 or Cable Modem 110 require replacement, an extra complication is  
29 involved for the establishment of the relationship between the Cable Modem 110  
30 and the Main Board 120. However, this could be accomplished by reprogramming

1 of an Electrically Erasable Programmable Read Only Memory (EEPROM) within  
2 either Cable Modem 110, Main Circuit Board 120 or both to establish the related  
3 MAC addresses.

4       Although the present invention has been described in terms of a Main Circuit  
5 Board and a Cable modem, those skilled in the art will appreciate that the present  
6 invention is equally applicable to a scenario wherein multiple modems are available  
7 to the Main Circuit Board. In this case, each modem has a unique signature and  
8 hardware MAC address that can be used in each of the above embodiments to  
9 distinguish between the multiple modems. Moreover, while the invention has been  
10 directed toward finding the address of a modem, it can be equivalently used to find  
11 the address of any network device.

12      Those skilled in the art will recognize that the present invention has been  
13 described in terms of exemplary embodiments based upon use of a programmed  
14 processor. However, the invention should not be so limited, since the present  
15 invention could be implemented using hardware component equivalents such as  
16 special purpose hardware and/or dedicated processors which are equivalents to  
17 the invention as described and claimed. Similarly, general purpose computers,  
18 microprocessor based computers, micro-controllers, optical computers, analog  
19 computers, dedicated processors and/or dedicated hard wired logic may be used  
20 to construct alternative equivalent embodiments of the present invention.

21      Those skilled in the art will also appreciate that the program steps used to  
22 implement the embodiments described above can be implemented using disc  
23 storage as well as other forms of storage including Read Only Memory (ROM)  
24 devices, Random Access Memory (RAM) devices; optical storage elements,  
25 magnetic storage elements, magneto-optical storage elements, flash memory, core  
26 memory and/or other equivalent storage technologies without departing from the  
27 present invention. Such alternative storage devices should be considered  
28 equivalents.

29      The present invention is preferably implemented using a programmed  
30 processor executing programming instructions that are broadly described above in

1 flow chart form and message flow diagram form. However, those skilled in the art  
2 will appreciate that the processes described above can be implemented in any  
3 number of variations and in many suitable programming languages without  
4 departing from the present invention. For example, the order of certain operations  
5 carried out can often be varied, and additional operations can be added without  
6 departing from the invention. Error trapping can be added and/or enhanced and  
7 variations can be made in user interface and information presentation without  
8 departing from the present invention. Such variations are contemplated and  
9 considered equivalent.

10 While the invention has been described in conjunction with specific  
11 embodiments, it is evident that many alternatives, modifications, permutations and  
12 variations will become apparent to those skilled in the art in light of the foregoing  
13 description. Accordingly, it is intended that the present invention embrace all such  
14 alternatives, modifications and variations as fall within the scope of the appended  
15 claims.

16 What is claimed is:  
17  
18

1       1. In a Set-Top Box configured with a modem and a Main Circuit Board, a  
2       method of enabling the Main Circuit Board to determine the IP address of the  
3       modem, comprising:

4               at the modem:

5                       periodically broadcasting a Discovery Packet from the modem to a  
6                       broadcast address, the Discovery Packet comprising at least the IP address  
7                       of the modem; and

8               at the Main Circuit Board:

9                       receiving the broadcast Discovery Packet from the modem; and  
10                       ascertaining the IP address of the modem from the broadcast  
11                       Discovery Packet.

12

13       2. The method according to claim 1, wherein the Discovery Packet further  
14       comprises an authentication code, and wherein the Main Circuit Board, upon  
15       receiving the Discovery Packet inspects the authentication code to assure that the  
16       IP address in the Discovery Packet originated at the modem.

17

18       3. The method according to claim 2, wherein the authentication code  
19       comprises a multiple character ascii character string.

20

21       4. The method according to claim 3, wherein the authentication code is  
22       encrypted.

1       5. The method according to claim 2, wherein the authentication code  
2       comprises a 10 character ascii character string.

3  
4       6. The method according to claim 5, wherein the authentication code is  
5       encrypted.

6  
7       7. The method according to claim 1, wherein the Discovery Packet further  
8       comprises a status code indicative of a running status of the modem.

9  
10     8. The method according to claim 7, wherein the status code is encrypted.

11  
12     9. The method according to claim 7, wherein the status code comprises a four  
13      byte integer code representing the running status of the modem.

14  
15     10. The method according to claim 9, wherein the status code is encrypted.

16  
17     11. The method according to claim 7, further comprising displaying a status of  
18      the modem on a display connected to the Main Circuit Board.

19  
20     12. The method according to claim 1, wherein the Discovery Packet is  
21      transmitted approximately every 30 seconds.

1       13. The method according to claim 1, wherein the modem comprises a Cable  
2       Modem.

3

4       14. The method according to claim 1, wherein the modem comprises a DSL  
5       modem.

6

7       15. The method according to claim 1, wherein the modem comprises a satellite  
8       modem.

9

10      16. The method according to claim 2, further comprising:

11           at a network device:

12               periodically broadcasting a Discovery Packet from the network device  
13               to a broadcast address, the Discovery Packet comprising at least the IP  
14               address of the network device and a signature of the network device; and  
15               at the Main Circuit Board:

16               receiving the broadcast Discovery Packet from the network device;  
17       and

18               ascertaining the IP address of the network device from the broadcast  
19               Discovery Packet after authenticating the network device from the network  
20               device's signature.

1       17. A Set-Top Box, comprising:  
2            a modem;  
3            a Main Circuit Board interconnected to the modem via an interconnection;  
4            means, residing within said modem, for periodically transmitting a Discovery  
5            Packet from said modem to said Main Circuit Board; and  
6            wherein the Discovery Packet comprises at least an IP address of the  
7            modem.

8  
9       18. The apparatus according to claim 17, wherein the Discovery Packet further  
10      comprises an authentication code, and wherein the Main Circuit Board, upon  
11      receiving the Discovery Packet inspects the authentication code to assure that the  
12      IP address in the Discovery Packet originated at the modem.

13  
14      19. The apparatus according to claim 18, wherein the authentication code  
15      comprises a multiple character ascii character string.

16  
17      20. The apparatus according to claim 19, wherein the authentication code is  
18      encrypted.

19  
20      21. The apparatus according to claim 18, wherein the authentication code  
21      comprises a ten character ascii character string.

1       22. The apparatus according to claim 21, wherein the authentication code is  
2       encrypted.

3  
4       23. The apparatus according to claim 17, wherein the Discovery Packet further  
5       comprises a status code indicative of a running status of the modem.

6  
7       24. The apparatus according to claim 23, wherein the status code is encrypted.

8  
9       25. The apparatus according to claim 23, wherein the status code comprises a  
10      multiple byte integer code representing the running status of the modem.

11  
12      26. The apparatus according to claim 23, wherein the status code comprises a  
13      four byte integer code representing the running status of the modem.

14  
15      27. The apparatus according to claim 17, wherein the Discovery Packet is  
16      transmitted approximately every 30 seconds.

17  
18      28. The apparatus according to claim 17, wherein the modem comprises a  
19      Cable Modem.

20  
21      29. The apparatus according to claim 17, wherein the modem comprises a DSL  
22      modem.

1       30. The apparatus according to claim 17, wherein the modem comprises a  
2       satellite modem.

3  
4       31. The apparatus according to claim 17, further comprising a display coupled  
5       to the Main Circuit Board.

6  
7       32. The apparatus according to claim 17, wherein the means for periodically  
8       transmitting a Discovery Packet comprises a programmed processor.

9  
10      33. The apparatus according to claim 18, further comprising:  
11            a network device interconnected with the Main Circuit Board;  
12            means, residing within said network device for periodically transmitting a  
13            Discovery Packet from said network device to said Main Circuit Board; and  
14            wherein the Discovery Packet comprises at least an IP address of the  
15            network device and a signature, wherein the Main Circuit Board distinguishes  
16            between the modem and the network device by the signature.

1           34. A Set-Top Box, comprising:

2            a modem;

3            a Main Circuit Board interconnected to the modem via an interconnection;

4            a programmed processor, residing within said modem, for transmitting a

5           Discovery Packet from said modem to said Main Circuit Board at intervals of

6           approximately 30 seconds;

7            wherein the Discovery Packet comprises an IP address of the modem, and

8           an encrypted ten character ascii authentication code, and wherein the Main Circuit

9           Board, upon receiving the Discovery Packet inspects the authentication code to

10           assure that the IP address in the Discovery Packet originated at the modem;

11           and wherein the Discovery Packet further comprises a four byte integer

12           status code indicative of a running status of the modem; and

13           a display, coupled to the Main Circuit Board, displaying the status of the

14           modem.

15

16           35. The apparatus according to claim 34, wherein the modem comprises a

17           Cable Modem.

18

19           36. The apparatus according to claim 34, wherein the modem comprises a DSL

20           modem.

1       37. The apparatus according to claim 34, wherein the modem comprises a  
2       satellite modem.  
3  
4

1           38. In Set-Top Box configured with a modem and a Main Circuit Board, a  
2           method of enabling the Main Circuit Board to determine the IP address of the  
3           modem, comprising:

4                   establishing a predetermined relationship between a hardware address of  
5                   the modem and a hardware address of the Main Circuit Board;

6                   at the Main Circuit Board:

7                           ascertaining the hardware address of the modem from the  
8                           predetermined relationship;

9                           sending a query from the Main Circuit Board to the hardware address  
10                           of the modem requesting the modem's IP address; and

11                           receiving a reply from the modem providing the modem's IP address  
12                           to the Main Circuit Board.

13  
14           39. The method according to claim 38, wherein the query and reply are carried  
15                   out using Reverse Address Resolution Protocol.

16  
17           40. The method according to claim 38, wherein the modem comprises a Cable  
18                   Modem.

19  
20           41. The method according to claim 38, wherein the modem comprises a DSL  
21                   modem.

22

1       42. The method according to claim 38, wherein the modem comprises a satellite  
2       modem.

3

4       43. The method according to claim 38, further comprising:  
5               establishing a predetermined relationship between a hardware address of  
6       a network device and a hardware address of the Main Circuit Board;

7               at the Main Circuit Board:  
8                       ascertaining the hardware address of the network device from the  
9       predetermined relationship;

10               sending a query from the Main Circuit Board to the hardware address  
11       of the network device requesting the network device's IP address; and  
12               receiving a reply from the network device providing the network  
13       device's IP address to the Main Circuit Board.

1       44. In Set-Top Box configured with first and second managed components and  
2       a control circuit, a method of enabling the control circuit to determine the IP  
3       address of the first and second managed components, comprising:

4               establishing a predetermined relationship between a hardware address of  
5       the first and second managed components and a hardware address of the control  
6       circuit;

7               at the Main Circuit Board:

8               ascertaining the hardware address of the first managed component  
9       from the predetermined relationship;

10               ascertaining the hardware address of the second managed  
11       component from the predetermined relationship;

12               sending a query from the Main Circuit Board to the hardware address  
13       of the first managed component requesting the first managed component's  
14       IP address;

15               receiving a reply from the first managed component providing the first  
16       managed component's IP address to the Main Circuit Board;

17               sending a query from the Main Circuit Board to the hardware address  
18       of the second managed component requesting the second managed  
19       component's IP address; and

20               receiving a reply from the second managed component providing the  
21       second managed component's IP address to the Main Circuit Board.

1       45. In a Set-Top Box configured with a modem and a Main Circuit Board, a  
2       method of enabling the Main Circuit Board to determine the IP address of the  
3       modem, comprising:

4               establishing a predetermined relationship between a hardware address of  
5       the modem and a hardware address of the Main Circuit Board;

6               at the Main Circuit Board:

7               ascertaining the hardware address of the modem from the  
8       predetermined relationship;

9               at the modem:

10               receiving a query from the Main Circuit Board to the hardware  
11       address of the modem requesting the modem's IP address; and

12               sending a reply from the modem providing the modem's IP address  
13       to the Main Circuit Board.

14

15       46. The method according to claim 45, wherein the query and reply are carried  
16       out using Reverse Address Resolution Protocol.

17

18       47. The method according to claim 45, wherein the modem comprises a Cable  
19       Modem.

20

21       48. The method according to claim 45, wherein the modem comprises a DSL  
22       modem.

1       49. The method according to claim 45, wherein the modem comprises a satellite  
2       modem.

RECORDED IN U.S. PATENT AND TRADEMARK OFFICE  
AT 10:00 AM ON 10/10/2008  
BY (RECORDED MAIL)

1       50. A Set-Top Box, comprising:  
2            a modem;  
3            a Main Circuit Board interconnected to the modem via an interconnection,  
4            the Main Circuit Board and the modem having hardware addresses which are  
5            related using a predetermined relationship;

6            means, residing within said Main Circuit Board, for determining the  
7            modem's hardware address from the Main Circuit Board's address and the  
8            predetermined relationship;

9            means, residing within said Main Circuit Board, for transmitting a request  
10          from the Main Circuit Board to said modem over the interconnection using the  
11          hardware address of the modem, the request comprising a request for the  
12          modem's current IP address; and

13            means, residing within said Main Circuit Board, for receiving a reply from  
14          the modem containing the modem's current IP address.

15  
16       51. The method according to claim 50, wherein the query and reply are carried  
17          out using Reverse Address Resolution Protocol.

18  
19       52. The apparatus according to claim 50, wherein the modem comprises a  
20          Cable Modem.

53. The apparatus according to claim 50, wherein the modem comprises a DSL modem.

54. The apparatus according to claim 50, wherein the modem comprises a satellite modem.

55. The apparatus according to claim 50, further comprising a display, coupled to the Main Circuit Board, displaying the status of the modem.

56. The apparatus according to claim 50, wherein the modem includes a programmed processor.

57. The apparatus according to claim 50, wherein the Main Circuit Board includes a programmed processor.

1       58. A Set-Top Box, comprising:  
2               a managed component;  
3               a Main Circuit Board interconnected to the managed component via an  
4               interconnection;  
5               means, residing within said managed component, for periodically  
6               transmitting a Discovery Packet from said managed component to said Main Circuit  
7               Board; and  
8               wherein the Discovery Packet comprises at least an IP address of the  
9               managed component.

10  
11       59. The apparatus according to claim 58, wherein the Discovery Packet further  
12               comprises an authentication code, and wherein the Main Circuit Board, upon  
13               receiving the Discovery Packet inspects the authentication code to assure that the  
14               IP address in the Discovery Packet originated at the managed component.

15  
16       60. The apparatus according to claim 59, wherein the authentication code  
17               comprises a multiple character ascii character string.

18  
19       61. The apparatus according to claim 59, wherein the authentication code is  
20               encrypted.

1       62. The apparatus according to claim 59, wherein the authentication code  
2       comprises a ten character ascii character string.

3  
4       63. The apparatus according to claim 62, wherein the authentication code is  
5       encrypted.

6  
7       64. The apparatus according to claim 58, wherein the Discovery Packet further  
8       comprises a status code indicative of a running status of the managed component.

9  
10      65. The apparatus according to claim 64, wherein the status code is encrypted.

1       66. A Set-Top Box, comprising:  
2               first and second managed components;  
3               a Main Circuit Board interconnected to the first and second managed  
4       components via an interconnection;  
5               means, residing within each of said first and second managed components,  
6       for periodically transmitting a Discovery Packet from each said managed  
7       component to said Main Circuit Board; and  
8               wherein the Discovery Packet comprises at least an IP address of the  
9       managed component from which it was transmitted.

10  
11       67. The apparatus according to claim 66, wherein the Discovery Packet further  
12       comprises an authentication code, and wherein the Main Circuit Board, upon  
13       receiving the Discovery Packet inspects the authentication code to determine which  
14       of the first and second managed components that the IP address in the Discovery  
15       Packet corresponds to.

16  
17       68. The apparatus according to claim 67, wherein the authentication code  
18       comprises a multiple character ascii character string.

19  
20       69. The apparatus according to claim 67, wherein the authentication code is  
21       encrypted.

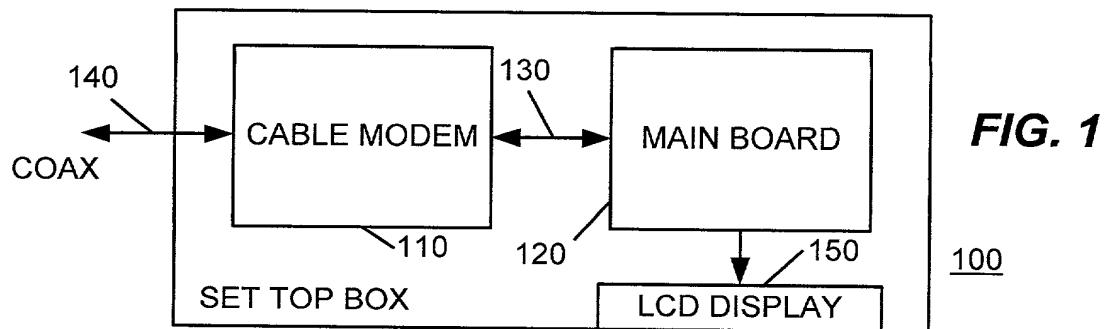
1       70. The apparatus according to claim 69, wherein the Discovery Packet further  
2       comprises a status code indicative of a running status of the managed component  
3       transmitting the discovery packet.

4

5       71. The apparatus according to claim 70, wherein the status code is encrypted.

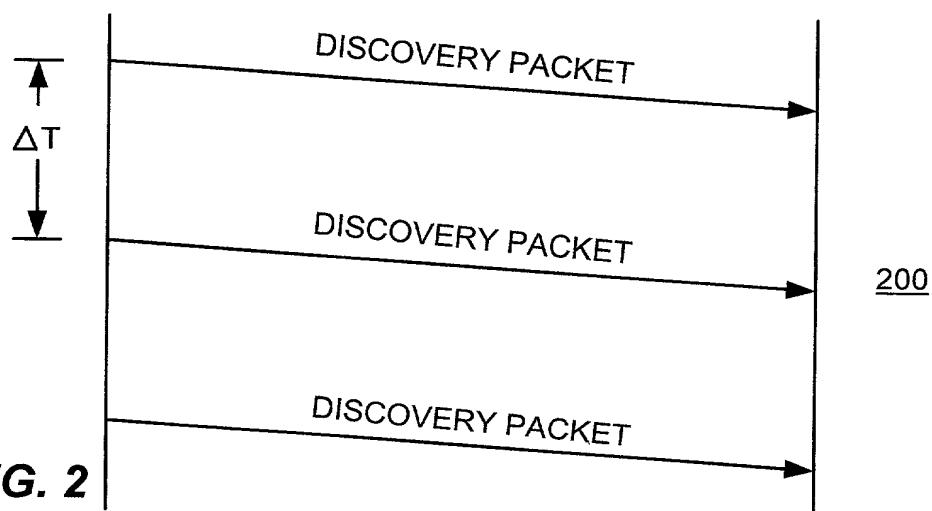
**ABSTRACT OF THE DISCLOSURE UNDER 37 C.F.R. §1.72(b)**

A Set-Top Box configured with a modem and a Main Circuit Board determines an IP address of the modem by periodically broadcasting a Discovery Packet from the modem to a broadcast address, the Discovery Packet comprising at least the IP address of the modem. At the Main Circuit Board, the broadcast Discovery Packet is received from the modem and the IP address of the modem is ascertained from the broadcast Discovery Packet.



MANAGED  
COMPONENT

MANAGER



200

FIG. 3

310

320

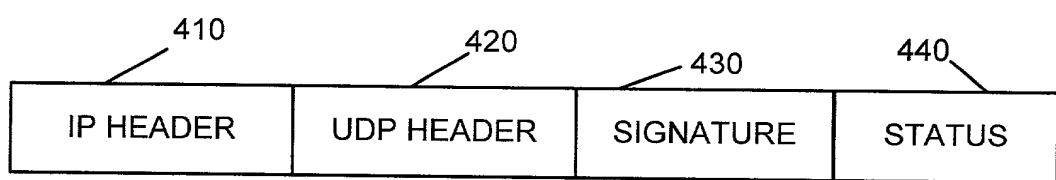
330

300

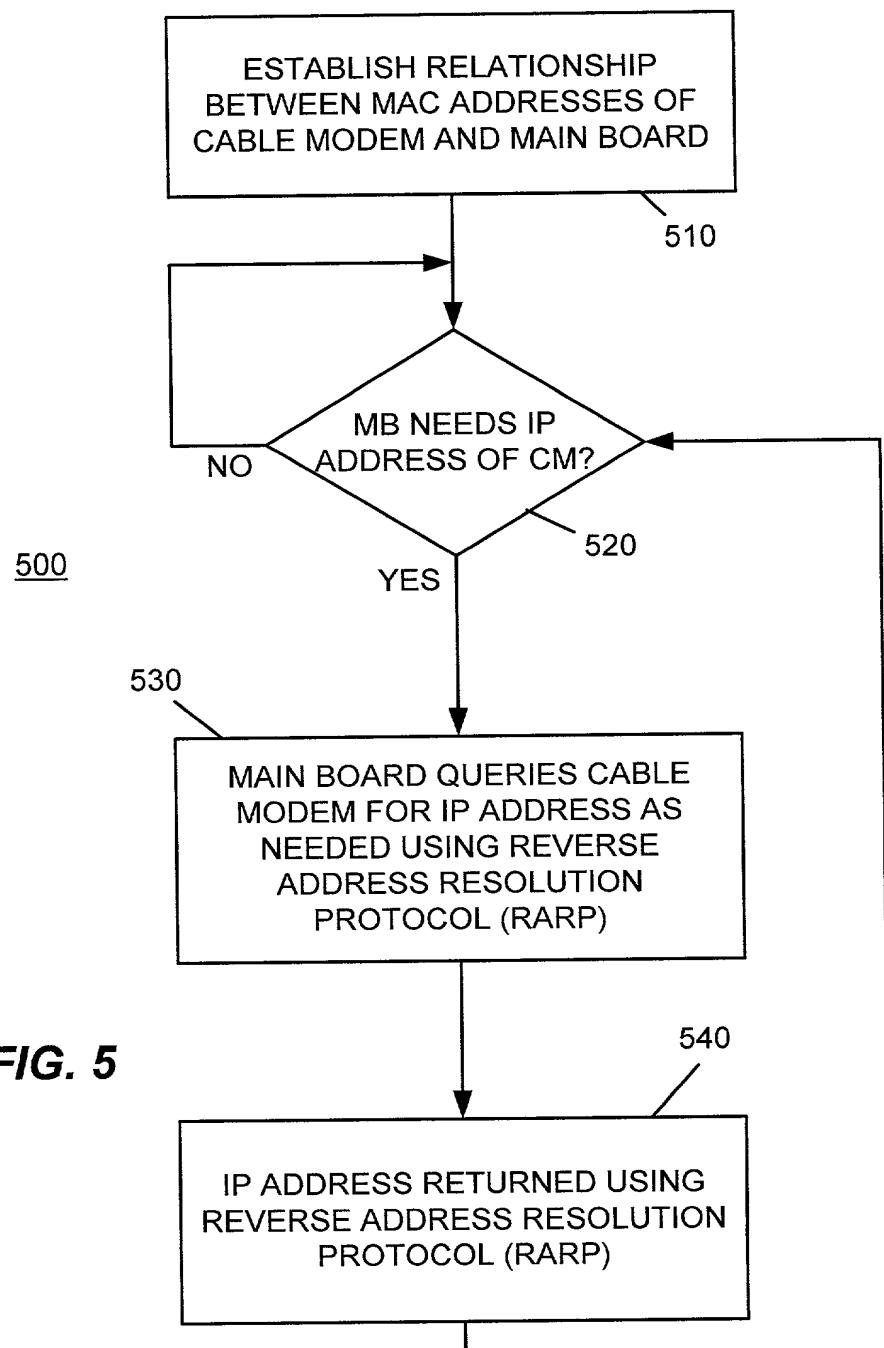
IP HEADER

UDP HEADER

SIGNATURE



400



**FIG. 5**

## PATENT APPLICATION

DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION

ATTORNEY DOCKETING SNY-PS3965

As a below named inventor, I hereby declare that:

My residence/post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

IP Address Discovery For Cable Modem in Set-Top Box

the specification of which is attached hereto unless the following box is checked:

was filed on \_\_\_\_\_ as US Application Serial No. or PCT International Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose all information which is material to patentability as defined in 37 CFR 1.56. Foreign Application(s) and/or Claim of Foreign Priority

I hereby claim foreign priority benefits under Title 35, United States Code Section 119 of any foreign application(s) for patent or inventor(s) certificate listed below and have also identified below any foreign application for patent or inventor(s) certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE FILED	PRIORITY CLAIMED UNDER 35 U.S.C. 119
			YES: <input type="checkbox"/> NO: <input type="checkbox"/>
			YES: <input type="checkbox"/> NO: <input type="checkbox"/>

## Provisional Application

I hereby claim the benefit under Title 35, United States Code Section 119(e) of any United States provisional application(s) listed below:

APPLICATION SERIAL NUMBER	FILING DATE

## U.S. Priority Claim

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION SERIAL NUMBER	FILING DATE	STATUS(patented/pending/abandoned)

## POWER OF ATTORNEY:

As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) listed below to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Jerry A. Miller, Reg. No. 30779

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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X  
Inventor's Signature

Sept 20, 2000  
Date

DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION (continued)

ATTORNEY DOCKET NO. SNY-P3965

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Inventor's Signature DateFull Name of Inventor: Eric Chen Citizenship: USAResidence: Saratoga SL 95070 SL  
12255 Saratoga Drive, Saratoga, CA USA 95070Post Office Address: SameX Eric Chen X September 20, 2000  
Inventor's Signature DateFull Name of Inventor: N/A Citizenship: Residence: Post Office Address: 

Inventor's Signature Date

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Inventor's Signature Date

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Inventor's Signature Date

Full Name of Inventor: N/A Citizenship: Residence: Post Office Address: 

Inventor's Signature Date